Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554



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| In the Matter of | ET Docket No. 94-32 |
| Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use | |

TO: The Commission

# COMMENTS OF
# INTERNATIONAL BUSINESS MACHINES CORPORATION

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December 19, 1994

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## SUMMARY

The Commission's own August 1994 report to NTIA and NTIA's very recent comments to the Commission in this docket make clear that the only appropriate allocation of the 2402-2417 MHz band is to the band's existing Part 15 and other incumbent uses. As both agencies have recognized, the Commission has actively encouraged investment of hundreds of millions of dollars by IBM and others in the development of wireless LANs and other spread spectrum technologies for operation in this band. These products are forming a vital part of the National Information Infrastructure, which would be substantially disrupted by any reallocation of the 2402-2417 MHz band to licensed uses. Given the absence of any real support for licensed use in this band and the significance of Part 15 use, there is no basis for the Commission to ignore the findings of its own prior report and the recent conclusions of NTIA.

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# COMMENTS OF INTERNATIONAL BUSINESS MACHINES CORPORATION

International Business Machines Corporation ("IBM") respectfully submits these comments in response to the Notice of Proposed Rule Making ("NPRM") in the above-referenced proceeding.[1/]

## Introduction

In the NPRM, the Commission proposes allocations of the 50 MHz of spectrum that the National Telecommunications and Information Administration ("NTIA") transferred from Federal Government to immediate private sector use. IBM's comments focus exclusively on the proposed allocation of the 2402-2417 MHz band. IBM strongly urges the Commission to follow its own prior conclusions in its report to NTIA in this matter, as well as NTIA's very recent recommendation to the Commission, and allocate

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1/ Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, ET Docket No. 94-32, FCC 94-272 (rel. Nov. 8, 1994) ("NPRM").

the 2402-2417 MHz band to its existing Part 15 and other incumbent uses.

As the Commission has acknowledged,[2/] since its first Spread Spectrum Order in 1985[3/] it has encouraged the investment of hundreds of millions of dollars by IBM and others to develop unlicensed wireless local area network ("LAN") and similar spread spectrum technologies for use in this band. These new technologies have now been brought to market, and -- as NTIA has recently advised the Commission[4/] -- they promise to form a vital part of the National Information Infrastructure ("NII"). Any allocation of this band for licensing to new private sector uses would not simply frustrate future development and market growth of these innovative technologies. It would also deny benefits to a wide variety of consumers and businesses already using these technologies today.

Such an allocation would also be flatly inconsistent with the Commission's own prior position in its August 1994 report to NTIA. As that report recognized, reallocating this band would deprive the public of Part 15 devices and other valuable existing uses of the band without providing any benefits

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2/ NPRM, Appendix D, ¶ 12 n.31; Report to Ronald H. Brown, Secretary, U.S. Department of Commerce, Regarding the Preliminary Spectrum Reallocation Report ("FCC Report"), FCC 94-213, ¶ 13 (rel. August 9, 1994).

3/ Authorization of Spread Spectrum and Other Wide Band Emissions, 101 F.C.C.2d 419 (1985).

4/ Letter from NTIA Assistant Secretary for Communications and Information Larry Irving to Chairman Hundt ("NTIA Letter") (December 12, 1994) (copy attached).

in return.[5] Thus, reallocating the band to licensed services would not "create new jobs" or "foster economic growth;"[6] it would substantially jeopardize existing wireless LAN and other spread spectrum investments. Moreover, reallocation would not "improve access to communications by industry and the American public;"[7] it would threaten to deprive schools, hospitals, and libraries of the benefits of improved communications and prevent the U.S. economy from obtaining the productivity and other competitive advantages provided by wireless LAN systems and similar technologies.

## I. AS THE COMMISSION AND NOW NTIA HAVE ALREADY FOUND, REALLOCATION OF THE 2402-2417 MHZ BAND TO ADDITIONAL PRIVATE USES WOULD SUBSTANTIALLY JEOPARDIZE HUNDREDS OF MILLIONS OF DOLLARS OF PRIVATE INDUSTRY INVESTMENTS IN WIRELESS LANS AND SIMILAR TECHNOLOGIES.

In the NPRM, the Commission seeks comment on the following three "[p]ossibilities" with respect to the 2402-2417 MHz band: "eliminating this band from Part 15 use . . . maintaining Part 15 use of this band and also implementing licensed services," or "maintaining Part 15 use of this band while limiting licensed use of the band."[8] The Commission itself has already recognized that the third option is the only

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[5] FCC Report, ¶ 51.

[6] NPRM, ¶ 1.

[7] Id.

[8] Id., ¶ 18.

viable one. As it pointedly concluded in its August 1994 report to NTIA, "Any future changes to this band could jeopardize significant private sector investments already made in this band and could result in a loss of benefits to the public and the Federal government."[9/]

That conclusion had already been well documented by IBM as well as others in comments filed at the Notice of Inquiry stage of this proceeding.[10/] This month, NTIA made clear that it now fully endorses that position. Its recent comments in this docket recognize that part 15 devices are of "critical importance . . . to the future development of the NII."[11/] Thus, it has concluded, "[p]roviding spectrum for nonlicensed uses should . . . be considered for the 2402-2417 MHz band."[12/]

### A. The Commission Has Actively Encouraged Hundreds Of Millions of Dollars Of Investment In Development And Implementation Of Unlicensed Part 15 Technology In The 2402-2417 Band Since 1985.

The present extensive use of the 2402-2417 MHz band by unlicensed Part 15 devices has been a direct and foreseeable result of the Commission's longstanding encouragement of the "rapid development of spread spectrum technology in the civilian

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9/ FCC Report, ¶ 51.

10/ Allocation of Spectrum Below 5 GHz, 9 FCC Rcd 2175 (1994).

11/ NTIA Letter.

12/ Id.

sector."[13] The Commission first opened the 2400-2483.5 MHz band to unlicensed Part 15 devices in 1985,[14] noting that there were "many useful communications applications which could be achieved with spread spectrum techniques that could not be satisfactorily developed with any other technology."[15] Since that time, the Commission has consistently acted to make its rules for Part 15 devices more flexible in order to "broaden their development and use."[16] As the Commission noted in 1990, its goal has been "to encourage the development and implementation of this exciting new family of technologies, and therefore seek to provide an appropriate regulatory framework in which there is maximum flexibility for the use of spread spectrum systems."[17]

Private industry eagerly accepted this regulatory offer. In response to the Commission's encouragement, manufacturers have spent hundreds of millions of dollars developing spread spectrum devices and systems for operation in

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[13] Authorization of Spread Spectrum and Other Wideband Emissions, 101 F.C.C. 2d at ¶ 31.

[14] Id.

[15] Authorization of Spread Spectrum and Other Wideband Emissions, 98 F.C.C. 2d 380, 383 (1984).

[16] Amendment of Parts 2 and 15 of the Rules with Regard to the Operation of Spread Spectrum Systems, 4 FCC Rcd 6370 (1989); see also 5 FCC Rcd 4123 (1990).

[17] Spread Spectrum Systems, 5 FCC Rcd at 4124. See also Revision of Part 15, 2 FCC Rcd 6135, 6137 (1987) ("We believe that the establishment of such bands will enable manufacturers to introduce new equipment or to take advantage of new technologies . . . . We expect this proposal to foster entire new categories of Part 15 devices and to provide major benefits to both manufacturers and consumers.")

the 2402-2417 MHz band. This investment, and the results it produced for society at large, were precisely what the Commission had intended. In its recent Report to NTIA in connection with these frequencies, the Commission noted:

> Our attempts to encourage this development have been successful and today millions of Part 15 spread spectrum devices provide a wide variety of communications services as well as services such as automated meter reading, inventory control, package tracking and shipping control, alarm devices, local area networks, and cordless phones.[18/]

IBM, like many other U.S. firms, has been fully committed to the development of these new spread spectrum technologies. It has expended tens of millions of dollars and countless person years of research in the development of the IBM Wireless LAN. On June 14, 1994, IBM announced that it would begin delivery of the first of these products, which have already met with overwhelming response. As IBM has noted in its earlier comments,[19/] the IBM Wireless LAN uses frequency hopping as its mode of spread spectrum transmission. In addition, it includes a dynamic interference avoidance mechanism (patent pending), which detects interference and changes the system's hopping patterns to avoid interfering signals. The segment below 2402-2417 MHz (2400-2402 MHz) is primarily used by amateur radio operators.

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[18/] FCC Report, ¶ 13.

[19/] See generally Reply Comments of International Business Machines Corporation (June 30, 1994).

And frequencies between 2417 MHz and 2483.5 MHz are less suitable for low-power wireless devices because of the presence of microwave oven emissions that peak at 2450 MHz. Thus, the IBM Wireless LAN was designed with the expectation that it would find minimal interference most often in the 2402-2417 MHz band. That band is its "sweet spot."

IBM also markets additional Part 15 devices that were designed to include substantial use of the 2402-2417 MHz band. IBM's AS/400 Wireless LAN and the family of handheld, portable transaction computers ("PTCs") both employ Part 15 spread spectrum technology. There are now over 400,000 PTC devices currently installed by IBM and others for use in data collection. IBM and other companies also have the next generation of Part 15 spread spectrum products currently under development.

The development of and demand for wireless data capabilities in this spectrum have now progressed to the point of establishing an industry standard. Until the Commission's present proposals were released, the IEEE 802.11 Committee had been expected to adopt a standard for wireless data transmission within the 2400-2483.5 MHz band by the first quarter of 1995. Because the 2400 MHz band is used throughout the world for unlicensed spread spectrum devices, use of this standard would allow U.S. manufacturers to produce equipment that can be marketed abroad as well as domestically, thereby substantially reducing unit production costs. There are already over 20 companies that have been granted FCC equipment authorizations for

wireless spread spectrum devices for use in the 2400 MHz band, including many start-up companies formed specifically for this purpose. In short, as the Commission itself has observed, "considerable investment has been made in developing equipment to operate in the 2400-2483.5 MHz band,"[20] and these uses of the band are increasing dramatically.[21]

### B. Reallocating this Spectrum Would Deprive The Public of an Important Sector in The National Information Infrastructure.

As NTIA noted in its recent letter to the Commission, "[t]he critical importance of wireless systems such as these to the future development of the National Information Infrastructure (NII) is well recognized and supported."[22] Unlicensed Part 15 devices are used in numerous consumer, industrial, medical, and educational settings. They have revolutionized retail and manufacturing markets, permitting more flexible layouts and instant access to information.

The IBM Wireless LAN, for example, is used in banks and other commercial settings. It has also proved to be extremely popular at hospitals, where its uses include providing hospital trauma centers with immediate access to patient information, as well as reducing paperwork and patient costs. And it has been installed at university and library locations, where it can be

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[20] FCC Report, ¶ 13.

[21] Id.

[22] NTIA Letter.

used to access research materials from other sources. In many schools, hospitals, and other buildings, wireless LANs are invaluable, because rewiring is either impractical due to the age, physical condition, or historical significance of the buildings, or dangerous because of asbestos.[23/] As Chairman Hundt has noted, "President Clinton and Vice President Gore [have] called upon the telecommunications industry to connect every classroom, every library and every hospital to the national information superhighway by the year 2000."[24/]

Reallocating the 2402-2417 MHz band to licensed uses would seriously jeopardize these expanding uses and applications. Primary licensed use of the band would effectively channel the IBM Wireless LAN (and other IBM spread spectrum products described above) into the upper portion of the ISM band, which is already significantly cluttered with microwave oven emissions. The resulting loss of speed and performance could make the product unmarketable, and could render equipment already in customers' hands unusable. IBM would potentially have to recall equipment currently being used by consumers and spend millions of dollars to redesign both hardware and software. IBM would also have additional development costs for products to be marketed abroad, because it would have to develop technology for the

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[23/] See Craig Matthias, Special Report/Wireless LANs, Data Communications (March 21, 1994).

[24/] Remarks of Chairman Reed E. Hundt Before NARUC at 6 (Nov. 15, 1994). See also Remarks of Vice President Gore at FCC Auction (December 5, 1994).

domestic market that was incompatible with equipment for the European and Asian markets, which use the 2400 MHz band for data transmission.

In fact, the Commission has already recognized the devastating effect that reallocation would have. It has concluded that "changes to this band could jeopardize significant private sector investments . . . . and could result in a loss of benefits to the public."[25/] The Commission and IBM have by no means been alone in their view that reallocation of this band would threaten the viability of spread spectrum technologies. Apple, AT&T, Interdigital, the Part 15 Coalition, and others have all confirmed that such a reallocation would result in "the diversion of untold millions of dollars of R&D, [and] manufacturing" and "curtail[ment of] the growth of the nonlicensed, Part 15 industry."[26/] Elimination of these emerging spread spectrum uses would thus, in their view, "impede the flow of technology, and the resulting products, from innovators to consumers."[27/]

These losses to developers of spread spectrum technologies would also translate into real losses for the U.S. economy. Wireless LANs promise to provide significant consumer and public benefits. One early estimate placed the overall

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25/ FCC Report, at ¶ 51.

26/ Comments of Interdigital at 6. See also comments cited in IBM Reply Comments at 6-7.

27/ Comments of Interdigital at 3.

annual cost of installing or relocating the wiring for office LANs at $1 billion.[28/] Moreover, without cables, LANs can support users who need access to computers but who often work away from a desk.[29/] Furthermore, because domestic wireless LANs can easily be adapted for use abroad as long as they operate in the 2400 MHz band, they can be a valuable segment of the U.S. export market. Industry consultants have advised IBM that the world market for wireless LANs will grow from approximately $200 million in 1994 to as much as $2.5 billion by 1998, for hardware alone. Other sources are consistent with these estimates,[30/] which confirm the substantial losses at stake were the Commission to reallocate this band.

The effect of reallocation on Part 15 devices could be irreversible, because there is currently no other spectrum that is suitable for the technology. As the Commission and NTIA have already recognized, the 902-928 MHz band is overcrowded.[31/] In addition, that band's smaller bandwidth does not permit the performance required by wireless LAN operations. The 5725-5850 MHz band requires semiconductor technology that is not commercially viable. Reallocating the 2402-2417 MHz band would

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[28/] Dryden, LANs Go Wireless with Technology Advances, LAN Times, Oct. 22, 1990, at 23.

[29/] InfoWorld, Study Projects Wireless Growth (June 6, 1994).

[30/] See InfoWorld, Study Projects Wireless Growth (June 6, 1994); Bruce Caldwell, Wireless LANs Add Appeal, InformationWeek (June 27, 1994).

[31/] FCC Report, ¶ 39; NTIA Letter.

thus not only jeopardize hundreds of millions of dollars of investment in the NII, made in reliance upon the Commission's rules, but also deprive the U.S. economy of billions of dollars in improvements in productivity.

## II. THE COMMISSION HAS ALSO ALREADY CONCLUDED THAT REALLOCATION OF THE 2402-2417 MHZ BAND TO ADDITIONAL PRIVATE USES WOULD SERVE NO OTHER PUBLIC INTEREST.

The NPRM's proposals to reallocate this band are all the more puzzling because of the overwhelming record evidence that the presently cluttered state of the band would provide new licensed users with very little of value. Indeed, in its August 1994 Report to NTIA, the Commission recognized that "[r]eallocation of the 2402-2417 MHz band presents little or no additional benefit to the public."[32/] The Commission based its findings in part on the substantial interference concerns present in the 2402-2417 MHz band:

> This would make it extremely difficult for any licensed communication system to operate and would greatly reduce the advantages of using advanced technologies . . . . [I]mplementing a communications system in this band will cost up to 50 times as much as a system operating in a band without interference from ISM devices.[33/]

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32/ FCC Report, ¶¶ 49-51.

33/ Id., ¶ 38.

The Commission therefore concluded that there was "limited possibility for implementing a licensed commercial service in the band."[34/]

The vast majority of comments already submitted to the Commission also indicate that licensed use of the band is highly improbable.[35/] As Southern Company noted, "[n]o opening really exists for the introduction of a new licensed service in the 2402-2417 MHz band despite the Federal Government's vacation of the band."[36/] AT&T's position was similar: "No case has yet been made that allocating that band to any new service would accomplish any worthwhile objective."[37/] Pacific Bell agreed: "Interference concerns severely limit the feasibility of new commercial services in this band."[38/]

Even the few comments that suggest using the 2402-2417 MHz band for other services note the difficulty that will be involved in overcoming interference concerns.[39/] Not one of these comments proposes a use for this spectrum for which

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34/ Id. ¶ 51.

35/ See, e.g., Comments of Apple Computer, Inc. at 1; Comment of Interdigital Communications Corp. at 3; Comments of the Part 15 Coalition at 4; Comments of Pacific Bell and Nevada Bell at 5; Comments of AT&T at 3-4; Reply Comments of AT&T at 4-5; Comments of Itron Inc. at 2.

36/ Comments of Southern Company at 7.

37/ Reply Comments of AT&T at 7.

38/ Comments of Pacific Bell and Nevada Bell at 5.

39/ See, e.g., Comments of APCO, at 6; Comments of FCCA at 2; Comments of COPE at 5; Reply Comments of Loral/Qualcomm at 2-3; Reply Comments of API at 7.

technology to overcome this interference is actually available. For example, APCO's suggestion that the spectrum be used for private mobile communications services is feasible only "assuming that methods are developed to alleviate problems posed by continuing use" of the band.[40/] Similarly, Loral/Qualcomm admitted that it had not yet tested the full effect of interference on mobile satellite services and later reversed its position and affirmed that the 2402-2417 MHz band was not usable for such services.[41/] UTI suggests that the band "might provide suitable spectrum for . . . systems which are able to . . . tolerate potential interference."[42/]

Such tenuous and unsubstantiated showings cannot support the Commission's obligation to determine that a reallocation will "promote public convenience or interest or will serve public necessity."[43/] This is especially true given Congress' mandate that analysis of any reallocation benefits include "the extent to which equipment is or will be available that is capable of utilizing the band."[44/] It makes little sense for the Commission to destroy Part 15 use of the spectrum, with its significant public benefits, in order to allocate the band to

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40/ Comments of APCO at 7.

41/ Comments of Loral\Qualcomm at 5; Reply Comments at 3.

42/ Comments of UTI at 6 (emphasis added).

43/ 47 C.F.R. § 303 (f); see also § 303 (c).

44/ 47 U.S.C. § 923 (c)(3)(A).

possible uses for which technology has not yet been -- and may not be -- invented.

Particularly in light of the Commission's own clear position on the devastating effects of allocating the 2402-2417 MHz band for licensed use, and the NTIA's recently stated position that the band should be allocated for unlicensed Part 15 use, the NPRM proposals for such licensed use of this band are difficult to understand. While reallocating the band to licensed uses may result in revenues for the Federal Government, the lack of support for these uses in the comments indicates that even this premise is highly questionable. In any event, Congress has clearly stated that "the Commission may not base a finding of public interest, convenience and necessity on the expectation of Federal revenues."[45/] In short, there seems to be absolutely no benefit -- and substantial private and public cost -- to a reallocation of this band to additional private use.

## III. ALLOCATING THE 2402-2417 MHZ BAND TO ITS INCUMBENT USES, INCLUDING PART 15 DEVICES, IS MOST CONSISTENT WITH CONGRESS' MANDATE AND THE PUBLIC INTEREST.

Congress directed the Commission to reallocate the initial 50 MHz of spectrum to radio services that would promote the development of new technology and efficient use of the spectrum.[46/] As noted above, unlicensed Part 15 devices are most apt to produce precisely these benefits. Thus, as the NTIA

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45/ 47 U.S.C. § 309 (j)(7)(A).

46/ See FCC Report, ¶ 47; 47 U.S.C. § 925.

recently urged the Commission, "[p]roviding spectrum for nonlicensed uses should . . . be considered for the 2402-2417 MHz band as part of the Commission's rulemaking on the spectrum transferred from Federal Government use."[47/]

Moreover, allocation of this spectrum to its incumbent uses best meets the statutory criteria enunciated by Congress in the Omnibus Budget Reconciliation Act of 1993 as amended, 47 U.S.C. §§ 923, 925. In mandating reallocation, Congress required that the following issues be evaluated: the costs associated with displacing existing services; the availability of technology capable of utilizing the spectrum; the spectrum's greatest potential for productive private use; and compatibility with frequency assignments abroad.[48/] Because the Commission has already acknowledged that reallocation of this spectrum to private use will involve tremendous costs with little public benefit, allocation of the band to its incumbent uses is clearly the most appropriate course of action. Indeed, given the enormous industry investment in Part 15 technologies and the serious economic impact of reallocation, as well as the Commission's active encouragement of these innovations and the industry's resulting "investment-backed expectations,"

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47/ NTIA Letter.

48/ 47 U.S.C. § 923 (c).

reallocating the spectrum to licensed use would appear to raise serious Fifth Amendment questions.[49/]

But there is also a more fundamental issue at stake here. While it is difficult for participants in the NII to predict where the information highway may lead, that is an unavoidable risk of doing business in a rapidly changing marketplace. But if U.S. firms cannot rely upon a consistent regulatory framework in which to plan their investments in the NII, they will be unable to justify many of these risks. In order to promote investment of the NII and enable the U.S. economy to benefit from its opportunities, it is imperative that the Commission provide clear and unequivocal reassurance that it does not intend to change the rules of the road. As the NTIA wrote in its recent letter, "We urge the Commission to provide a long-term, stable regulatory environment for . . . nonlicensed users, consistent with international spectrum allocations . . . . [in order to] accelerate private sector development of products and services that will further both the National and Global Information Infrastructures."[50/] Such an environment requires prompt and decisive action from the Commission.

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[49/] See, e.g., Lucas v. South Carolina Coastal Council, 112 S.Ct. 2886 (1992); Ruckelshaus v. Monsanto Co., 467 U.S. 986 (1984). See also Monongahela Navigation Co. v. U.S., 148 U.S. 312, 335 (1893); Kaiser Aetna v. U.S., 444 U.S. 164, 179 (1979); Kirchdorfer, Inc. v. U.S., 6 F.3d 1573, 1582 (Fed. Cir. 1993). This is particularly troubling in light of the court's ruling that the Commission lacks takings authority. Bell Atlantic Telephone Cos. v. FCC, 24 F.3d 1441 (D.C. Cir. 1994).

[50/] NTIA Letter.

## CONCLUSION

For the foregoing reasons, IBM respectfully requests that the Commission allocate the 2402-2417 MHz band to incumbent uses, and decline to allocate it to any other licensed use.

Respectfully submitted,

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December 19, 1994

**CERTIFICATE OF SERVICE**

I, Lynn R. Charytan, hereby certify that I have this 19th day of December, 1994, caused to be delivered by first-class mail (except as noted) the foregoing Reply Comments of International Business Machines Corporation to the persons named on the attached service list.

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